

Form PTO-1449 (modified)

List of Patents and Publications for Applicant's

INFORMATION DISCLOSURE STATEMENT

(Use several sheets if necessary)

Atty. Docket No.
102-0072US-4Serial No.
09/923,058Inventor/Applicant:
Becker, et al. / Micron Technology, Inc.Title: METHODS FOR ENHANCING SILICON
DIOXIDE TO SILICON NITRIDE
SELECTIVITY (as previously amended)Filing Date:
08/06/01Group:
1763

U.S. Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Name	Class	Sub Class	Filing Date of App.
gpg	A1	3,479,237 ✓	11/18/1969	Bergh, et al.	156	11	04/08/66
	A2	4,180,432 ✓	12/25/1979	Clark	156	643	12/19/77
	A3	4,241,165 ✓	12/23/1980	Hughes, et al.	430	269	09/05/78
	A4	4,244,752	01/13/1981	Henderson, et al.	148	1.5	03/06/79
	A5	4,283,249 ✓	08/11/1981	Ephrath, L.M.	156	643	08/17/1979
	A6	4,324,611 ✓	04/13/1982	Vogel, et al.	156	643	06/26/80
	A7	4,350,578	09/21/82	Frieser, et al.	204	192 R	05/11/81
	A8	4,352,724 ✓	10/5/1982	Sugishima, et al.	204	192	11/19/1980
	A9	4,368,092	01/11/83	Steinberg, et al.	156	345	08/05/81
	A10	4,371,407 ✓	02/01/1983	Kurosawa, K.	148	187	10/28/1981
	A11	4,374,698 ✓	02/22/1983	Sanders, et al.	156	643	07/09/81
	A12	4,377,438	03/22/1983	Moriya, et al.	156	643	09/22/81
	A13	4,401,054	08/30/1983	Matsuo, et al.	118	723	04/27/81
	A14	4,439,270 ✓	03/27/1984	Powell, et al.	156	644	08/08/83
	A15	4,461,672	07/24/1984	Musser, M.E.	156	644	11/18/1982
	A16	4,492,620	01/08/1985	Matsuo, et al.	204	192 R	09/09/83
	A17	4,511,430 ✓	04/16/85	Chen, et al.	156	643	01/30/84
	A18	4,522,681 ✓	06/11/1985	Gorowitz, et al.	156	643	04/23/1984
	A19	4,568,410	02/04/1986	Thornquist	156	643	12/20/84
gpg	A20	4,581,101	04/08/1986	Senoue, et al.	156	643	10/04/84

EXAMINER:

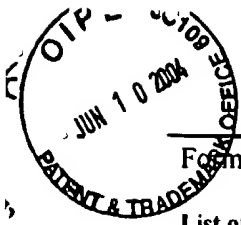
George Goudreau

DATE CONSIDERED:

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EXAMINER: INITIAL IF REFERENCE CONSIDERED, WHETHER OR NOT CITATION IS IN CONFORMANCE WITH MPEP609; DRAW LINE THROUGH CITATION IF NOT IN CONFORMANCE AND NOT CONSIDERED. INCLUDE COPY OF THIS FORM WITH NEXT COMMUNICATION TO APPLICANT.

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gag	A21	4,675,073	06/23/87	Douglas, M.	156	643	03/07/86
	A22	4,711,698	12/08/1987	Douglas, M.	156	643	07/15/85
	A23	4,734,152✓	03/29/1988	Geis, et al.	156	646	07/13/87
	A24	4,734,157	03/29/1988	Carbaugh, et al.	156	643	03/18/87
	A25	4,778,561	10/18/88	Ghanbari, E.	156	643	10/30/87
	A26	4,789,560	12/06/1988	Yen	427	96	01/08/86
	A27	4,807,016✓	02/21/89	Douglas, M.	357	67	11/20/87
	A28	4,870,245	09/26/1989	Price, et al.	219	121.36	04/01/85
	A29	4,877,641	10/31/1989	Dory	427	38	05/31/88
	A30	4,892,753	01/09/1990	Wang, et al.	427	38	10/26/88
	A31	4,912,061	03/27/1990	Nasr	437	44	04/04/88
	A32	4,918,031	04/17/1990	Flamm, et al.	437	225	12/28/88
	A33	4,948,458	08/14/1990	Ogle, J.S.	156	643	08/14/89
	A34	4,952,274	08/28/1990	Abraham, T.	156	643	05/27/1988
	A35	4,966,870	10/30/1990	Barber, et al.	437	228	08/08/1989
	A36	4,971,655	11/20/1990	Stefano, et al.	156	659.1	12/26/89
	A37	4,978,420	12/18/1990	Bach	156	643	01/03/90
	A38	5,013,398	05/07/1991	Long, et al.	156	643	05/29/90
	A39	5,013,692	05/07/1991	Ide, et al.	437	241	12/05/89
	A40	5,021,121✓	06/04/1991	Groechel, et al.	156	643	02/16/90
	A41	5,040,046✓	08/13/1991	Chhabra, et al.	357	54	10/09/90
gag	A42	5,043,790	08/27/1991	Butler	357	68	04/05/90

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gag	A43	5,091,326	02/25/1992	Haskell, J.D.	437	43	09/12/90
	A44	5,093,277	03/03/1992	Arima, et al.	437	69	03/02/90
	A45	5,176,790	01/05/1993	Arleo, et al.	156	643	09/25/1991
	A46	5,200,358	04/06/1993	Bollinger, et al.	437	180	11/15/1991
	A47	5,242,538	09/07/1993	Hamrah, et al.	156	643	01/29/92
	A48	5,244,837	09/14/1993	Dennison, C.H.	437	195	03/19/1993
	A49	5,269,879	12/14/93	Rhoades, et al.	156	643	10/16/91
	A50	5,286,344	02/15/1994	Blalock, et al.	156	657	06/15/92
	A51	5,286,667	02/15/1994	Lin, et al.	437	52	08/11/92
	A52	5,290,726	03/01/1994	Kim, H.S.	437	52	02/18/1992
	A53	5,296,095	03/22/94	Nabeshima, et al.	156	662	10/30/91
	A54	5,298,463	03/29/1994	Sandhu, et al.	437	192	04/16/1992
	A55	5,302,236	04/12/1994	Tahara, et al.	156	643	10/18/1991
	A56	5,316,616	05/31/1994	Nakamura, et al.	156	643	05/27/93
	A57	5,321,211	06/14/1994	Haslam, et al.	174	262	04/30/1992
	A58	5,338,398	08/16/1994	Szwejkowski, et al.	156	655	12/23/92
	A59	5,338,700	08/16/1994	Dennison, et al.	437	60	04/14/1993
	A60	5,364,804	11/15/1994	Ho, et al.	437	41	11/03/93
gag	A61	5,366,590	11/22/1994	Kadomura, S.	156	662	03/17/1994

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gag	A62	5,372,969	12/13/1994	Moslehi, M. M.	437	195	03/03/1992
	A63	5,376,233	12/27/1994	Man	156	662	12/30/92
	A64	5,423,945	06/13/1995	Marks, et al.	156	662.1	09/08/92
	A65	5,429,710	07/04/1995	Akiba, et al.	216	17	02/16/94
	A66	5,451,290	09/19/1995	Salfelder	216	67	02/11/93
	A67	5,468,342	11/21/1995	Nulty, et al.	156	643.1	04/28/94
	A68	5,470,768	11/28/1995	Yanai, et al.	437	40	08/05/93
	A69	5,477,975	12/26/95	Rice, et al.	216	68	10/15/93
	A70	5,503,901	04/02/96	Sakai, et al.	428	161	06/29/94
	A71	5,556,501	09/17/96	Collins, et al.	156	345	04/04/93
	A72	5,562,801	10/08/96	Nulty, J.E.	156	643.1	12/07/94
	A73	5,772,832	06/30/1998	Collins, et al.	156	345	04/04/97
	A74	5,880,036	03/09/1999	Becker, et al.	438	740	11/15/93
	A75	5,880,037	03/09/99	Arleo, P.	438	740	10/09/97
	A76	5,888,414	03/30/1999	Collins, et al.	216	68	09/24/97
	A77	6,184,150	02/06/2001	Yang, et al.	438	740	10/27/97
	A78	6,194,325	02/27/2001	Yang, et al.	438	740	12/04/95
	A79	5,439,846	08/08/1995	Nguyen, et al.	437	187	12/17/93
	A80	5,731,242	03/24/1998	Parat, et al.	438	586	11/14/95
gag	A81	5,554,557	09/10/1996	Koh, Chao-Ming	437	52	02/02/96

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Foreign Patent Documents

Exam. Init.	Ref. Des.	Document Number	Date	Country	Class	Sub Class	Translation Yes/No
gag	B1	0 050 972 A2	05/05/1982	EPO	H01L	21/88	Yes ✓
	B2	0 265 584 A2	04/05/88	EPO	H01L	21/31	Yes ✓
	B3	0 520 519 A1	12/30/1992	EPO	H01J	37/32	Yes ✓
	B4	0 552 490 A1	07/28/1993	EPO	H01L	21/311	Yes ✓
	B5	0 644 584 A1	03/22/1995	EPO	H01L	21/311	Yes ✓
	B6	0 651 434 A2	05/03/1995	EPO	H01L	21/311	Yes ✓
	B7	01-015930	01/19/1989	Japan	H01L	21/302	Abstract Only ✓
	B8	2 175 542 A	12/03/1986	United Kingdom	C23F	1/02	Yes ✓
	B9	2-62038	03/01/90	Japan	H01L	21/302	Abstract Only ✓
	B10	JP60143633	07/29/1985	Japan	H01L	21/302	Abstract only ✓
	B11	4-298032	10/21/1992	Japan	H01L	21/302	Abstract Only ✓
	B12	55009464	01/23/80	Japan	H01L	27/08	Abstract Only ✓
	B13	57210631	12/24/82	Japan	H01L	21/302	Abstract Only ✓
	B14	58-53833	03/30/1983	Japan	H01L	21/302	Abstract Only ✓
	B15	60111474	06/17/1985	Japan	H01L	29/80	Abstract Only ✓
	B16	61-224423	10/06/1986	Japan	H01L	21/302	Abstract Only ✓
	B17	0 777 267	10/31/1996	EP	H01L	21/311	yes ✓
	B18	JP02198634	08/07/1990	Japan	B01J	23/24	Abstract only ✓
	B19	JP03262503	11/22/1991	Japan	B01D	19/00	Abstract only ✓
	B20	JP04180222	06/26/1992	Japan	H01L	21/302	Abstract only ✓
	B21	JP04298032	10/21/1992	Japan	H01L	21/302	Abstract only ✓
gag	B22	JP58053833	03/30/1983	Japan	H01L	21/302	Abstract only ✓

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Other Art (Including Author, Title, Date Pertinent Pages, Etc.)

Exam. Init.	Ref. Des.	Citation	
gag	C1	D. Kenney et al., "A Buried-Plate Trench Cell for a 64-Mb DRAM," 1992 Symposium of VLSI, IEEE, pp. 14-15 (1992).	✓
	C2	K.H. Kusters et al., "A High Density 4Mbit DRAM Process Using a Fully Overlapping Bitline Contact (FoBIC) Trench Cell," Corporate Research and Technology, 1987 Symposium on VLSI Technology Digest of Technical Papers, pp. 93-94 (1987).	✓
	C3	J.A. Bondur & C.F. Crimi, "Gas Mixing to Prevent Polymer Formation During Reactive Ion Etching," IBM Technical Disclosure Bulletin, Vol. 21, No. 10, pg. 4016 (Mar. 1979).	✓
	C4	Bondur, J.A. & Schwartz, S.M., "Selective Reactive Ion Etching of Silicon Compounds," IBM Tech. Disclosure Bulletin, Vol. 21, No. 10, pg. 4015 (Mar. 1979).	✓
	C5	M. Nawata et al., "High-Rate and Highly Selective Etching of SiO ₂ Using Microwave Plasma," 183rd Meeting Electrochemical Society, Honolulu, Hawaii, pp. 228-234 (1993).	✓
	C6	A.M. Barklund & H.O. Blum, "Influence of Different Etching Mechanisms on the Angular Dependence of Si ₃ N ₄ Etching," J. Vac. Sci. Technol. A, Vol. 11, No. 4, pp. 1226-1229 (Jul. 1993).	✓
	C7	J.C. Arnold et al., "Influence of Reactant Transport on Fluorine RIE of Deep Trenches in Si," J. Vac. Sci. Technol. B, Vol. 11, No. 6, pp. 2071-2080 (Nov. 1993).	✓
	C8	P.E. Clarke et al., "Mass Spectrometric Studies of Plasma Etching of Si ₃ N ₄ ," J. Vac. Sci. Technol. B, Vol. 3, No. 6, pp. 1614-1619 (Nov. 1985).	✓
	C9	T.J. Dalton et al., "Microtrench Formation in Polysilicon Plasma Etching Over Thin Gate Oxide," J. Electrochem. Soc., Vol. 140, No. 8, pp. 2395-2401 (Aug. 1993).	✓
	C10	A. Mikasa et al., "Novel Surface Reaction Model in Dry-Etching Process Simulator," Jpn. J. Appl. Phys., Vol. 31, Pt. 1, No. 12B, pp. 4363-4369 (Dec. 1992).	✓
	C11	Y.X. Li et al., "Plasma Etching of Polysilicon/Nitride/Polysilicon Sandwich Structure for Sensor Applications," Microelectron. Engrg., 21, pp. 341-344 (1993).	✓
	C12	Y. Hikosaka & H. Sugai, "Radical Kinetics in a Fluorocarbon Etching Plasma," Jpn. Appl. Phys., Vol. 32, No. 6, pp. 3040-3044 (Jun. 1993).	✓
	C13	J.L. Lindstrom et al., "Reactive Ion Etching of Silicon Nitride Deposited by Different Methods in CF ₄ /H ₂ Plasmas," J. Electrochem. Soc., Vol. 139, No. 1, pp. 317-320 (Jan. 1992).	✓
	C14	K.H. Kuesters et al., "Self-Aligned Bitline Contact for 4 Mbit DRAM," pp. 640-649, 1987 (journal/book unknown).	✓
	C15	G.S. Oehrlein & H.L. Williams, "Silicon Etching Mechanisms in a CF ₄ /H ₂ Glow Discharge," J. Appl. Phys., Vol. 62, No. 2, pp. 662-672 (Jul. 1987).	✓
gag	C16	S.C. McNevin, "The Correlation Between Selective Oxide Etching and Thermodynamic Prediction," AT&T Bell Laboratories, 1994 American Vacuum Society Symposium, p. 120.	✓

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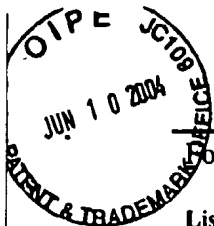
Other Art (Including Author, Title, Date Pertinent Pages, Etc.)

Exam. Init.	Ref. Des.	Citation	
gag	C17	T. Kure et al., "VLSI Device Fabrication Using Unique, Highly-selective Si ₃ N ₄ Dry Etching," Proceeding of the International Electron Devices Meeting (IEDM), pp. 757-759 (1983).	✓
	C18	D.S. Becker & G. Blalock, "A method of obtaining a high oxide to nitride selectivity in an MERIE Reactor," 1993 Symposium of Dielectric Science and Technology and Electronics Divisions of The Electrochemical Society, Vol. 93-21, pp. 178-189 (May 19, 1993).	✓
	C19	Anonymous, "Selective Reactive Ion Etch for Silicon Oxide Over Silicon Nitride," Research Disclosure, No. 30159, pg. 340 (May 1989).	✓
	C20	H.T. Arends et al., "Mass Spectrometry and Reactive Ion Etching of Silicon Nitride (Si ₃ N ₄), Silicon Dioxide, and Silicon in Freon on Various Electrode Materials," in <i>Symposium Proceedings—International Symposium of Plasma Chemistry</i> , Vol. 3, 7 th Ed.(Eindrove pubs.), pp. 1007-1012 (1985).	✓
	C21	M. Armacost et al., "Selective Oxide: Nitride Dry Etching in a High Density Plasma Reactor," Symposium of Dielectric Science and Technology and Electronics Divisions of the Electrochemical Society, Vol. 93-21, pp. 190-200 (May 19, 1993).	✓
	C22	A.J. Bariya et al., "The Etching of CHF ₃ Plasma Polymer in Fluorine-Containing Discharges," <i>Journal of Vacuum Science and Technology B</i> , Vol. 9, No. 1, pp. 1-7 (1991).	✓
	C23	E.Y. Chang et al., "A Selective Dry-Etch Technique for GaAs MESFET Gate Recessing," <i>IEEE Trans. Electron. Devices</i> , Vol. 35, No. 10, pp. 1580-84 (1988).	
	C24	J. W. Coburn, "Increasing the Etch Ratio of SiO ₂ /Si in Fluorocarbon Plasma Etching," <i>IBM Technical Disclosure Bulletin</i> , Vol. 19, No. 10, pg. 3854 (1977).	
	C25	J.W. Coburn & E. Kay, "Some Chemical Aspects of the Fluorocarbon Plasma Etching of Silicon and Its Compounds," <i>IBM J. Res. Develop.</i> , Vol. 23, No. 1, pp. 33-41 (1979).	
	C26	Complaint for Declaratory Relief, filed in <i>Sandisk Corp. v. Micron Tech., Inc.</i> , Case No. C-02-2627VRW (N. D. Cal. May 31, 2002).	
	C27	R. D'Agostino, "Summary Abstract: Mechanisms of Polymerization in Discharges of Fluorocarbons," <i>J. Vacuum Sci. & Tech.</i> , Vol. 3, No. 6, pp. 2627-28 (1985).	
	C28	D.L. Flamm & V.M. Donnelly, "The Design of Plasma Etchants," <i>Plasma Chemistry and Plasma Processing</i> , Vol. 1, No. 4, pp. 317-63 (1981).	
gag	C29	H. Gilboa et al., "Nondestructive Characterization of RIE Induced Radiation Damage Using Surface Accoustic Waves," <i>Mat. Res. Soc. Symp. Proc.</i> , Vol. 38, pp. 511-17 (1985).	

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gag	C30	G.S. Oehrlein & Y.H. Lee, "Reactive Ion Etching Related Si Surface Residues and Subsurface Damage: Their Relationship to Fundamental Etching Mechanisms," J. Vacuum Sci. & Tech. A, Vol. 5, No. 4, pp. 1585-94 (1987).
	C31	W.J. Grande et al., "Characterization of Etch Rate and Anisotropy in the Temperature-Controlled Chemically Assisted Ion Beam Etching of GaAs," J. Vac. Sci. & Technol. B, Vol. 8, No. 5, pp. 1075-79 (1990).
	C32	Y. Horiike et al., "High Rate and Highly Selective SiO ₂ Etching Employing Inductively Coupled Plasma and Discussion on Reaction Kinetics," Journal Unknown, pp. 801-809 (received Oct. 27, 1994; Accepted Mar. 17, 1995).
	C33	Kaga, T. et al., "Crown-Shaped Capacitor Cell for 1.5 V Operation 65 Mb DRAMs," IEEE Transactions on Electronic Devices, Vol. 38, No. 2, pp. 255-61 (1991).
	C34	K.H. Kusters et al., "A Self Aligned Contact Process with Improved Surface Planarization," Journal de Physique, Vol. 49, Colloque C4, Suppl. 9, C4503-06 (1988).
	C35	L.M. Loewenstein, "Selective Etching of Silicon Nitride Using Remote Plasmas of CF ₄ and SF ₆ ," J. Vac. Sci. & Tech, Vol. 7, No. 3, pp. 686-90 (1989).
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Form PTO-1449 (modified)

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102-0072US-4Serial No.
09/923,058List of Patents and Publications for Applicant's
INFORMATION DISCLOSURE STATEMENTInventor/Applicant:
Becker, et al. / Micron Technology, Inc.Title: METHODS FOR ENHANCING SILICON
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SELECTIVITY (*as previously amended*)

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	C44	Preliminary Invalidity Contentions regarding Parent Patent 6,015,760, filed in <i>Sandisk Corp. v. Micron Tech., Inc.</i> , Civ. No. CV02-2627CW (N. D. Cal. Nov. 21, 2002).
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